



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/018,020	12/14/2001	Syuichi Izuchi	Y31-138999C/KK	3545

7590 04/21/2004

McGinn & Gibb
Suite 200
8321 Old Courthouse Road
Vienna, VA 22182-3817

EXAMINER

TSANG FOSTER, SUSY N

ART UNIT	PAPER NUMBER
----------	--------------

1745

DATE MAILED: 04/21/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/018,020	Applicant(s) IZUCHI ET AL.	
	Examiner Susy N Tsang-Foster	Art Unit 1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 January 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 1/7/2004 has been entered.

Response to Amendment

2. This Office Action is responsive to the amendment filed on 1/7/2004. Claims 1-3, 6, 12, and 17-20 have been amended. Claims 1-20 are pending and are rejected for reasons given below.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 1-20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claims 1, 19, and 20, the limitation "in a range of 5% to 30 wt%" is indefinite because it does not give the basis of this percentage. For the purposes of prosecution, this limitation is

Art Unit: 1745

interpreted as in a range of 5% to 30 wt% based on the sum of the weight of the polymer and the liquid electrolyte in light of the original disclosure.

In claim 2, the limitation "in a range of 10% to 25% by weight" is indefinite because it does not give the basis of this percentage. For the purposes of prosecution, this limitation is interpreted as in a range of 10% to 25 wt% based on the sum of the weight of the polymer and the liquid electrolyte in light of the original disclosure.

Claims depending from claims rejected under 35 USC 112, second paragraph are also rejected for the same.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 1-20 are rejected under 35 U.S.C. 102(e) as being anticipated by Taniuchi et al. (US Pat. No. 6,013,393).

Taniuchi et al. disclose a lithium battery comprising a positive electrode, a negative electrode, a separator, and a gel electrolyte comprising a polymerized polyfunctional (meth)acrylate monomer in any one of the negative electrode, positive electrode or separator or a combination thereof (col. 1, lines 40-45; col. 3, lines 1-11; col. 6, lines 56-67; col. 7, lines 1-67; col. 8, lines 1-21).

Art Unit: 1745

Specifically, Taniuchi et al. disclose that the gel electrolyte can comprise a polymerized monofunctional or polyfunctional (meth)acrylate (col. 3, lines 8-11). The polyfunctional (meth)acrylate used is a monomer or prepolymer having at least two (meth)acryloyl groups (col. 3, lines 60-67). At least two (meth)acryloyl groups encompass bifunctional, trifunctional, and tetrafunctional metha(acrylate)s. Column 3, lines 12-52 give examples of the monofunctional (meth)acrylate. Specific examples are given for polyfunctional (meth)acrylates in col. 4, lines 1-15, including bi(meth)acrylates, tri(meth)acrylates, and hexa(meth)acrylates. The reference also discloses at column 4, lines 28-30 that any of the mentioned (meth)acrylate monomers may be used alone or in combination in the present invention. Thus, polyfunctional (meth)acrylate monomers may be used alone.

The reference also discloses that the electrolyte salt component is a sulfonated derivative that can be LiCF_3SO_3 , $\text{LiN}(\text{CF}_3\text{SO}_2)_2$, $\text{LiC}(\text{CF}_3\text{SO}_2)_3$, and $\text{LiCH}(\text{CF}_3\text{SO}_2)_2$ where each of these sulfonated derivative comprises an organic anion (col. 4, lines 58-60). In addition, inorganic electrolyte salts LiPF_6 and LiBF_4 are also used in combination with the sulfonated derivative (col. 4, lines 61-67). The concentration of the sulfonated derivative in the nonaqueous solution is normally in the range of 1 to 7 moles/liters and preferably 2 to 5 moles/liters in a nonaqueous electrolytic solution (col. 5, lines 12-20). The amount of inorganic salt used in combination with the sulfonated derivative is preferably in the range of 1 to 9 moles per mole of the sulfonated derivative. When 1 to 7 moles/liter of the sulfonate salt is used, the amount of the inorganic salt can also be 1 to 7 moles/liter to give a total of 2 to 14 moles of lithium salt in the electrolytic solution. When 2 to 5 moles/liter of the sulfonate salt is used, the amount of the inorganic salt can also be 2 to 5 moles/liter to give a total of 4 to 10 moles of lithium salt in the

Art Unit: 1745

electrolytic solution. Some of the examples in the reference also show (1) 1.8 mol/l of the sulfonated derivative and 0.2 mol/l of LiBF_4 (see example 3 at col. 9, lines 45-63) to give a total amount of lithium salt concentration of 2.0 mol/l; and (2) 2.0 mol/l of LiBF_4 in comparative example 3 (col. 10, lines 1-12).

The non-aqueous solvent used in the electrolyte can be propylene carbonate, ethylene carbonate, and γ -butyrolactone (col. 5, lines 32-40). When γ -butyrolactone is used alone, the amount of γ -butyrolactone would be 100% by weight of the non-aqueous solvent which is greater than or equal to 50 wt%.

The amount of the non-aqueous electrolytic solution is normally 200 parts by weight or more, preferably in the range of 400 to 900 parts by weight, more preferably in the range of 500 to 800 parts by weight, to 100 parts by weight of a polymer matrix for the ionic conductive polymer gel (polymer gel electrolyte) of the invention of the reference (col. 5, lines 20-32). When the polyfunctional (meth)acrylate monomer is used singly in the polymer matrix, the amount of the monomer would be either $100/(400 + 100) \times 100\%$ to $100/(900 + 100) \times 100\%$ or **10 wt% to 20 wt% of the total weight of the polymer gel electrolyte**, or $100/(500 + 100) \times 100\%$ to $100/(100 + 800) \times 100\%$ or **11wt % to 17 wt% of the total weight of the polymer gel electrolyte**.

7. Claims 1, and 3-20 are rejected under 35 U.S.C. 102(e) as being anticipated by Hasegawa et al. (US Patent No. 5,972,539).

Art Unit: 1745

Hasegawa et al. disclose a lithium battery having a power-generating element comprising a positive electrode, a negative electrode, and a gel electrolyte as a separator and the gel electrolyte comprises a polymer and a liquid electrolyte and the concentration of the lithium salt in the liquid electrolyte is preferably 0.5 to 2 M (see col. 9, lines 1-52; col. 10, lines 28-47 and Figure 1). The unit M is equivalent to moles per liter of the liquid electrolyte.

The ratio by weight between the ion conductive polymer and the liquid electrolyte in the gel electrolyte is 10:90 to 90:10 (col. 9, lines 60-65) which is equal to 10 to 90% by weight of the polymer based on the sum of the weight of the polymer and the liquid electrolyte.

In an specific example, a gel electrolyte is obtained by polymerizing a mixture of a monomer given by formula (IV) which has two polymerizable functional groups and a methyl methacrylate and the resulting copolymer is solvent casted into a film and dried (col. 13, lines 24-39). Formula IV shows a monomer with bifunctional (meth)acrylate groups. The dried copolymer film is immersed into a liquid electrolyte to form the gel electrolyte and the gel electrolyte contains 70 weight% liquid electrolyte and **30 weight % of the polymer** (col. 13, lines 32-39). The gel electrolyte can also be formed by adding the liquid electrolyte to a mixture of a polymer and a flame retardant monomer followed by a crosslinking reaction which would harden the mixture (col. 9, lines 35-52).

The lithium salt in the liquid electrolyte can be at least one of LiBF_4 , LiPF_6 , LiAsF_6 , LiClO_4 , LiCF_3SO_3 (which has an organic anion), $\text{LiN}(\text{CF}_3\text{SO}_2)_2$ (which has an organic anion), $\text{LiN}(\text{C}_2\text{F}_5\text{SO}_2)_2$ (which has an organic anion), or $\text{LiC}(\text{CF}_3\text{SO}_2)_3$ (which has an organic anion) (col. 2, lines 41-45) and the organic solvent used in the liquid electrolyte can be γ -butyrolactone which would be 100% by weight of the organic solvent in the liquid electrolyte (col. 9, lines 25-

Art Unit: 1745

34 and lines 53-60). The organic solvent in the liquid electrolyte ethylene carbonate, propylene carbonate, γ -butyrolactone and mixtures thereof (col. 9, lines 55-60).

Response to Arguments

8. Applicant's arguments with respect to claims 1-20 rejected by Taniuchi of record have been considered but are moot in view of the new ground(s) of rejection.

9. Applicant's arguments filed 1/7/2004 have been fully considered but they are not persuasive.

With respect to art rejections based on Hasegawa of record, applicant asserts that the concentration of 0.5 to 2 moles/liter is clearly outside the claimed range of lithium salt of from 2 to 4 moles/liter.

In response, the range of Hasegawa is not outside the claimed range but overlaps with the claimed range at an endpoint. The endpoint of 2 moles/liter of Hasegawa anticipates the claimed range of 2 to 4 moles/liter.

With respect to Hasegawa of record, applicant also asserts that Hasegawa is directed to a completely different subject matter from the claimed invention and that Hasegawa is merely intended to provide a flame retardant solid electrolyte by mixing a polymer with a halogen or phosphorus containing compound and that Hasegawa does not discuss at least one purpose (e.g. to provide good (g. high rate) discharge performance) to which the claimed invention is directed.

Art Unit: 1745

In response, Hasegawa discloses the same claimed subject matter as the present application for reasons given above. In an specific example, a gel electrolyte is obtained by polymerizing a mixture of a monomer given by formula (IV) which has two polymerizable functional groups and a methyl methacrylate and the resulting copolymer is solvent casted into a film and dried (col. 13, lines 24-39). Formula IV shows a monomer with bifunctional (meth)acrylate groups. The dried copolymer film is immersed into a liquid electrolyte to form the gel electrolyte and the gel electrolyte contains 70 weight% liquid electrolyte and 30 weight % of the polymer (col. 13, lines 32-39). The gel electrolyte can also be formed by adding the liquid electrolyte to a mixture of a polymer and a flame retardant monomer followed by a crosslinking reaction which would harden the mixture (col. 9, lines 35-52). This disclosure is in contrast to applicant's assertions on page 13 of the amendment that Hasegawa does not disclose a gel electrolyte which includes a polymerized polyfunctional (meth)acrylate monomer in a range from 5% to 30% by weight.

Furthermore, an anticipatory reference discloses all the limitations of the claimed subject matter and need not have the same purpose as the applicant's present invention or recognize inherent properties stated by applicant.

Conclusion

Any inquiry concerning this communication or earlier communications should be directed to examiner Susy Tsang-Foster, Ph.D. whose telephone number is (571) 272-1293. The examiner can normally be reached on Monday through Friday from 9:30 AM to 6:00 PM.

Art Unit: 1745

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached at (571) 272-1292.

The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

st/ *Susy Tsang Foster*

Susy Tsang-Foster
Primary Examiner
Art Unit 1745